Africa RISING perspectives from the East, West & South

Kennedy Ng'ang'a

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LAND / WATER MANAGEMENT IN BABATI, TANZANIA

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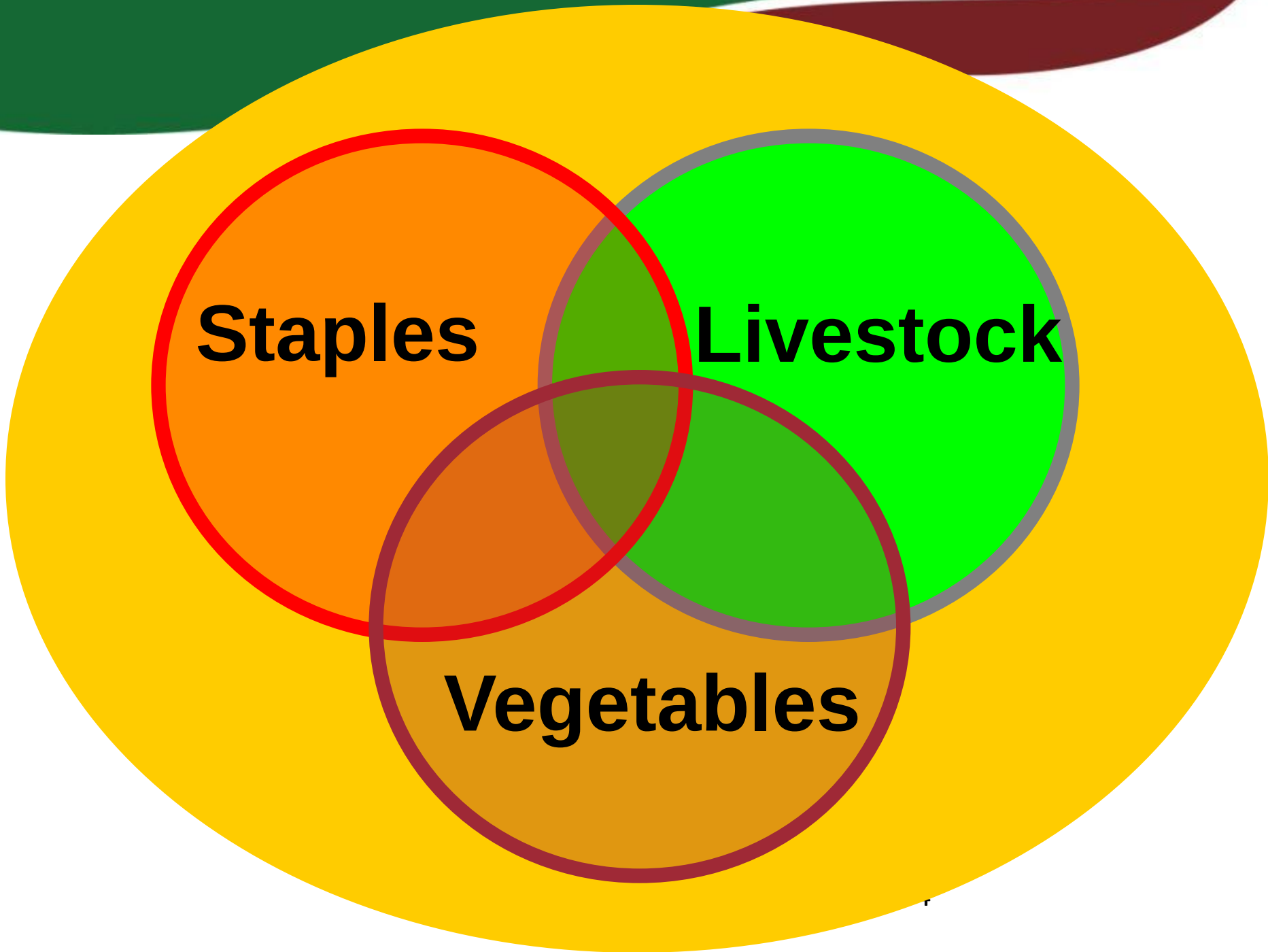
Piloting technologies

Piloting scalable farmer technology initiatives

- Increased crop and system productivity;
- Sustainable use of the natural resource base: Soils, water, biomass and

Production constraints	AR Interventions: System responses	Tools and approaches	Scenario assessments	Next steps
Soil limitations	Fertilizer trials	Farmer assessments	Crop yields	Scaling of feasible technologies
Climate variability	Biophysical monitoring	Participatory field days	Soil moisture	Validation of scenarios
Low system productivity	Forage integration	System level approaches	Organic carbon	Iterative linkage to AR4D Platforms
Maize leaf necrosis		Soil, Crop & climate models	Sediment levels	Strategic partnerships
		Primary data	Runoff levels	Targeting policies for adoption
		GIS/Spatial analysis tools	Farm level economic gains	
		Surveys		


Staples
Livestock
Vegetables

On-going work

I In-situ field monitoring (2014)

II Scenarios

III Validation, recommendations and scaling 2015-2016

Tools and approaches

2014-2015

- Farmer assessments
- Participatory field days
- System level approaches
- Soil, Crop & climate models
- Primary data
- GIS/Spatial analysis tools

Yield (Mg/ha)

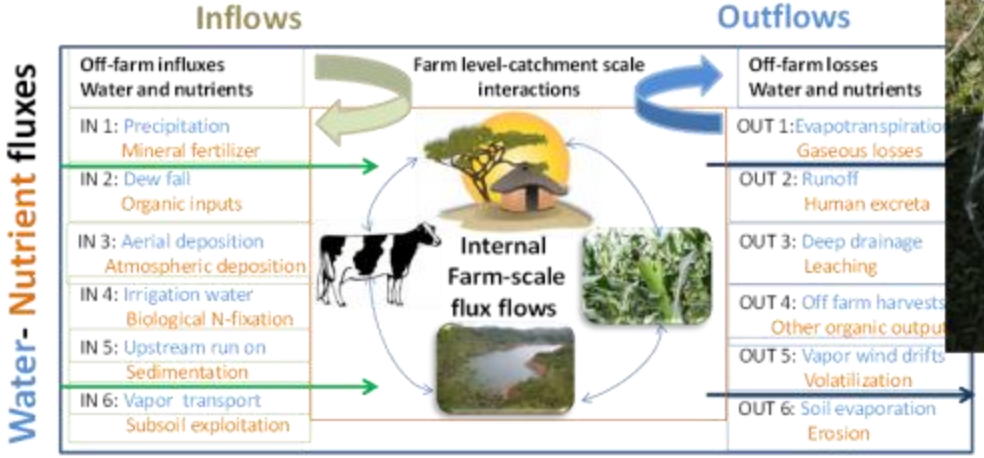
nd agro-forestry practices
duce sediment yield

Silvo-pastoral practices and cropping in uplands

Water harvesting structures, livestock and farming

Water resources management in valley bottoms: rice and aquaculture

Historical datasets



On-going work

I In-situ field monitoring (2014)

II Scenario

Tools and approaches

- Farmer assessments
- Participatory field days
- System level approaches
- Soil, Crop & climate models
- Primary data
- GIS/Spatial analysis tools

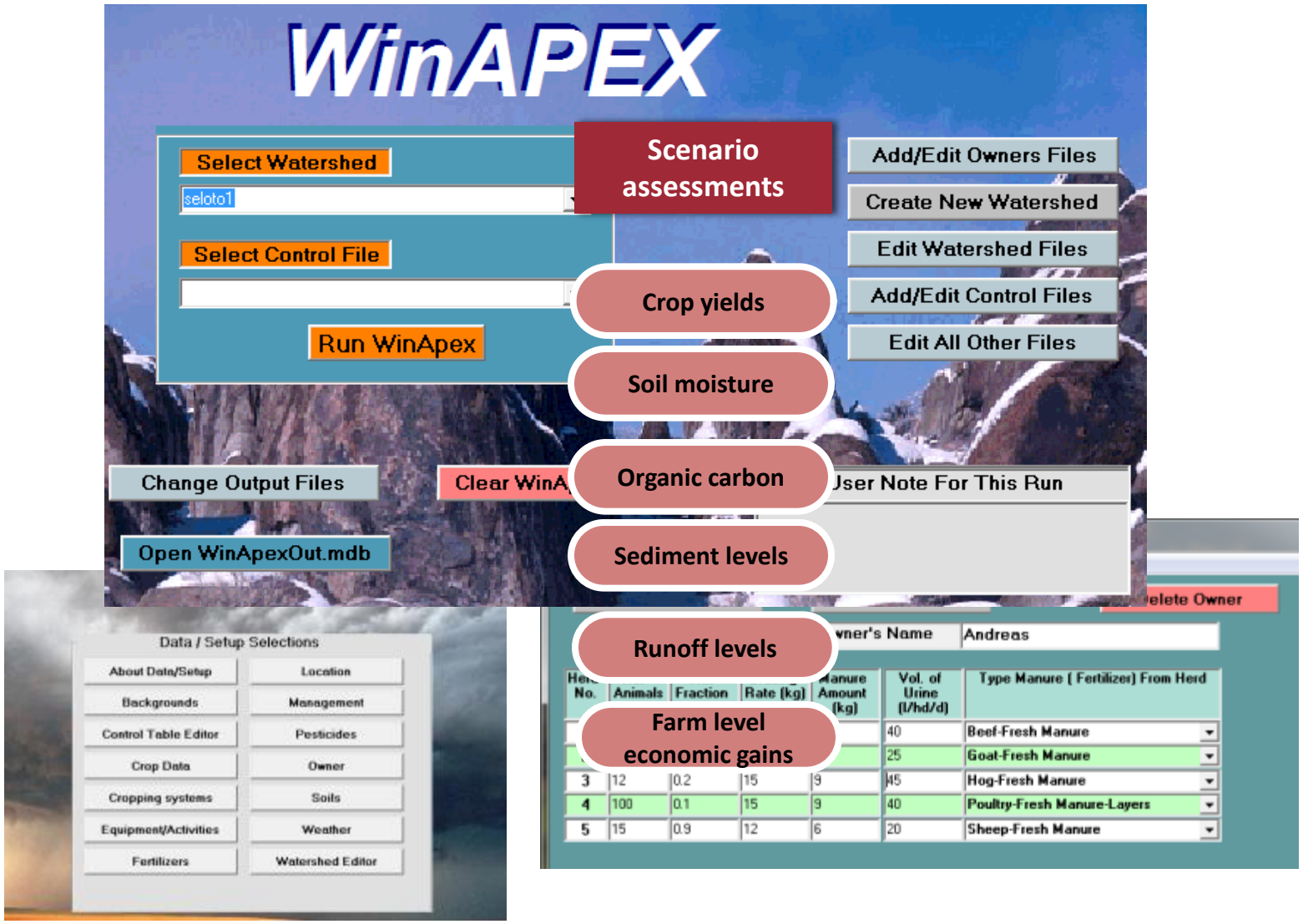
III Validation, recommendations and scaling 2015-2016

Historical datasets

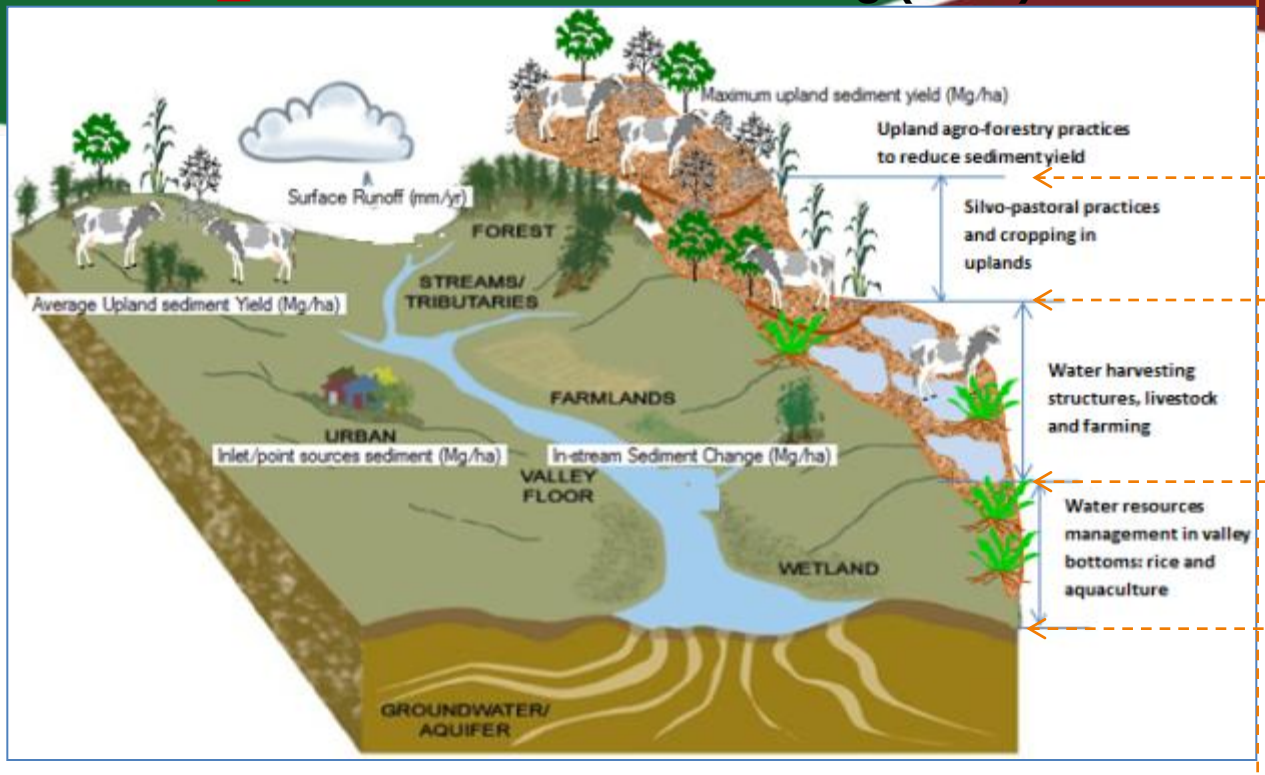
Water- Nutrient fluxes

Inflows		Outflows
Off-farm influxes Water and nutrients	Farm level-catchment scale interactions	Off-farm losses Water and nutrients
IN 1: Precipitation Mineral fertilizer	Internal Farm-scale flux flows	OUT 1: Evapotranspiration Gaseous losses
IN 2: Dew fall Organic inputs		OUT 2: Runoff Human excreta
IN 3: Aerial deposition Atmospheric deposition		OUT 3: Deep drainage Leaching
IN 4: Irrigation water Biological N-fixation		OUT 4: Off farm harvests Other organic output
IN 5: Upstream run on Sedimentation		OUT 5: Vapor wind drifts Volatilization
IN 6: Vapor transport Subsoil exploitation		OUT 6: Soil evaporation Erosion

Scenario assessments

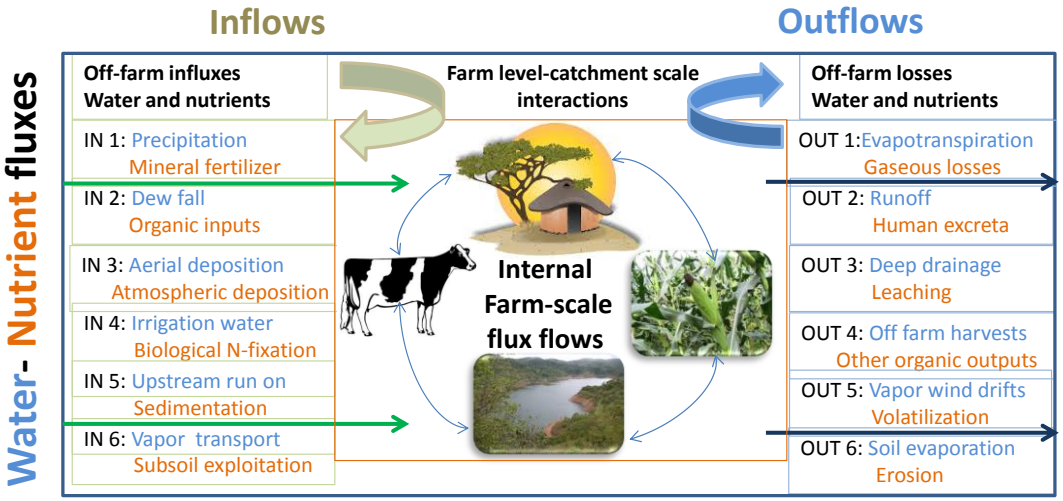


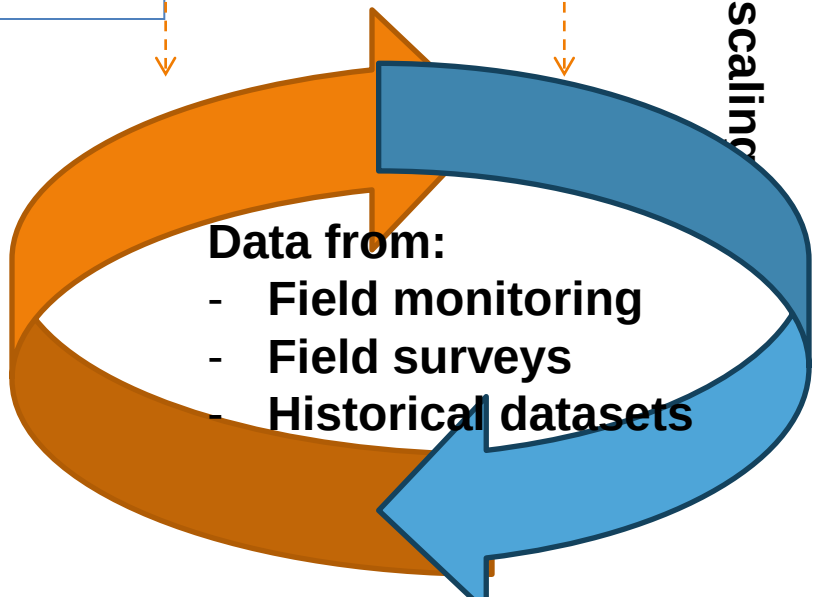
I In-situ field monitoring (2014)



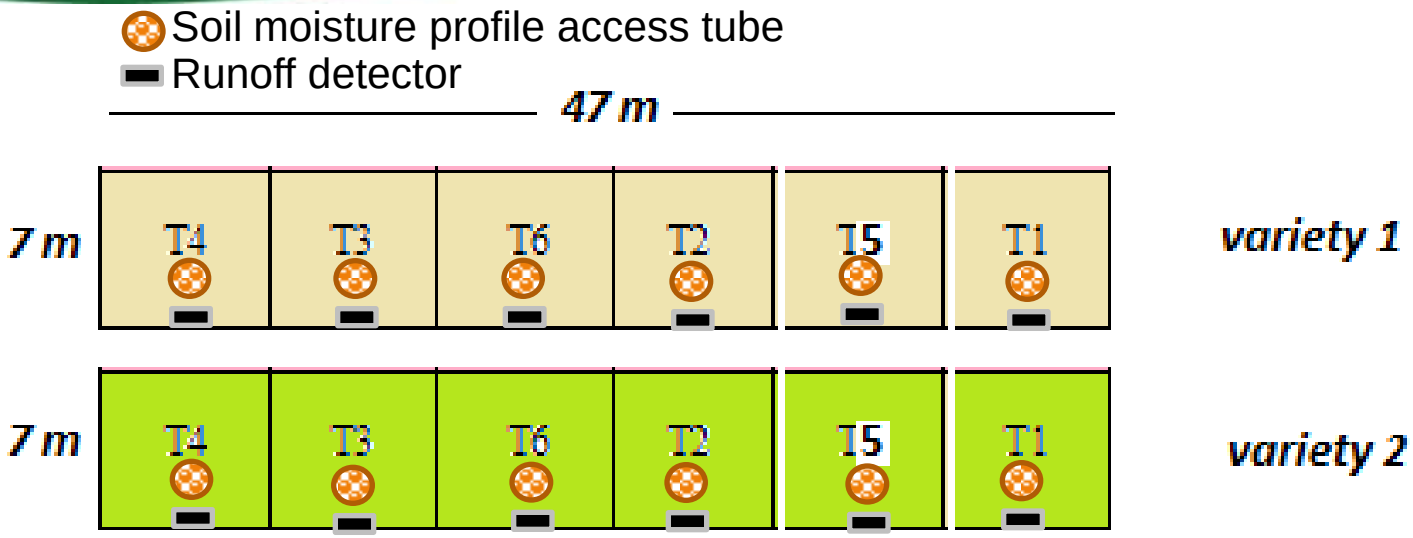
II Scenario Assessments 2014-2015

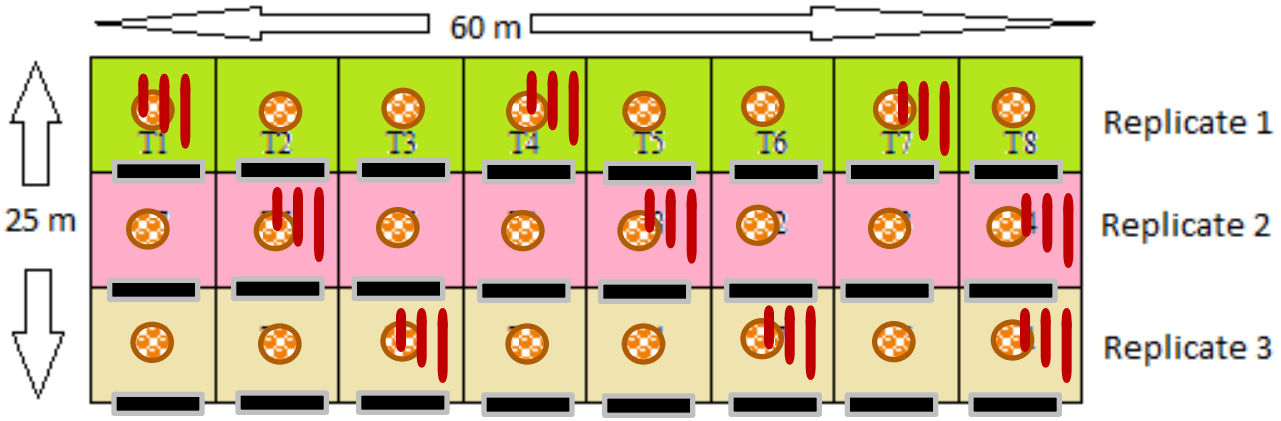
III Validation, recommendations and scaling 2015-2016





Soil moisture and nutrient monitoring in variety and fertilizer trials





Soil moisture profile access tubes (probes are in center of plot)

Soil loss and runoff detector (Detectors placed at lower end of plot)

Suction lysimeters staggered at different depths to capture leachate in and beyond the root zone

Erosion and soil moisture retention along contoured steep farming slopes

Experimental Focus: Erosion and soil moisture retention along contoured steep farming slopes

Date trial started: May 2014

Objective: Demonstrate the impact of terrace bunds on soil moisture capture and erosion Control with sequential testing of the impact of forages

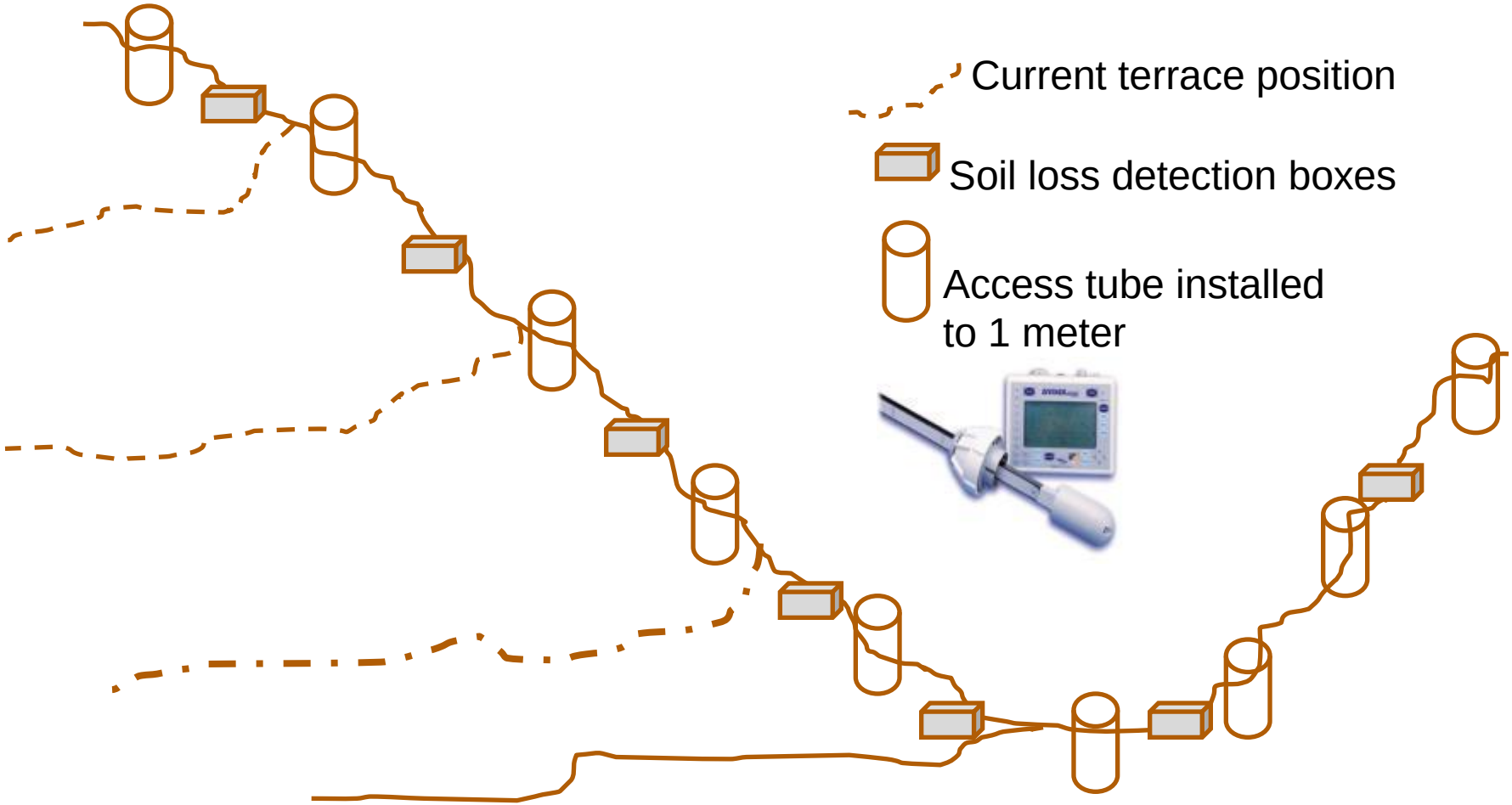
Types of measurements: Rainfall amount (farmer managed), soil moisture content, runoff detection and soil loss

Frequency of measurements: Soil moisture: Start, mid and end of the month. Runoff detection and soil loss estimated periodically by accumulated volume of soil in soil traps. Actual runoff amount are modeled.

Depth to the profile for soil moisture readings: 1 meter

Instruments being used
Rainfall: Rain gauge (automated and manual)
Soil moisture: Diviner 2000
Runoff detection: Infiltration tests with mini-disk infiltrometer
Soil loss: Calibrated soil traps
Other observations: Dates of planting, dates of harvesting, crop yields along different slope positions, water quality measures above and below the slope positions

Layout: Erosion and soil moisture retention along contoured steep farming slopes



Role of forage grasses on soil moisture and erosion mediation

Experimental Focus: Role of forage grasses on soil moisture and erosion mediation

Date trial started: June 2014

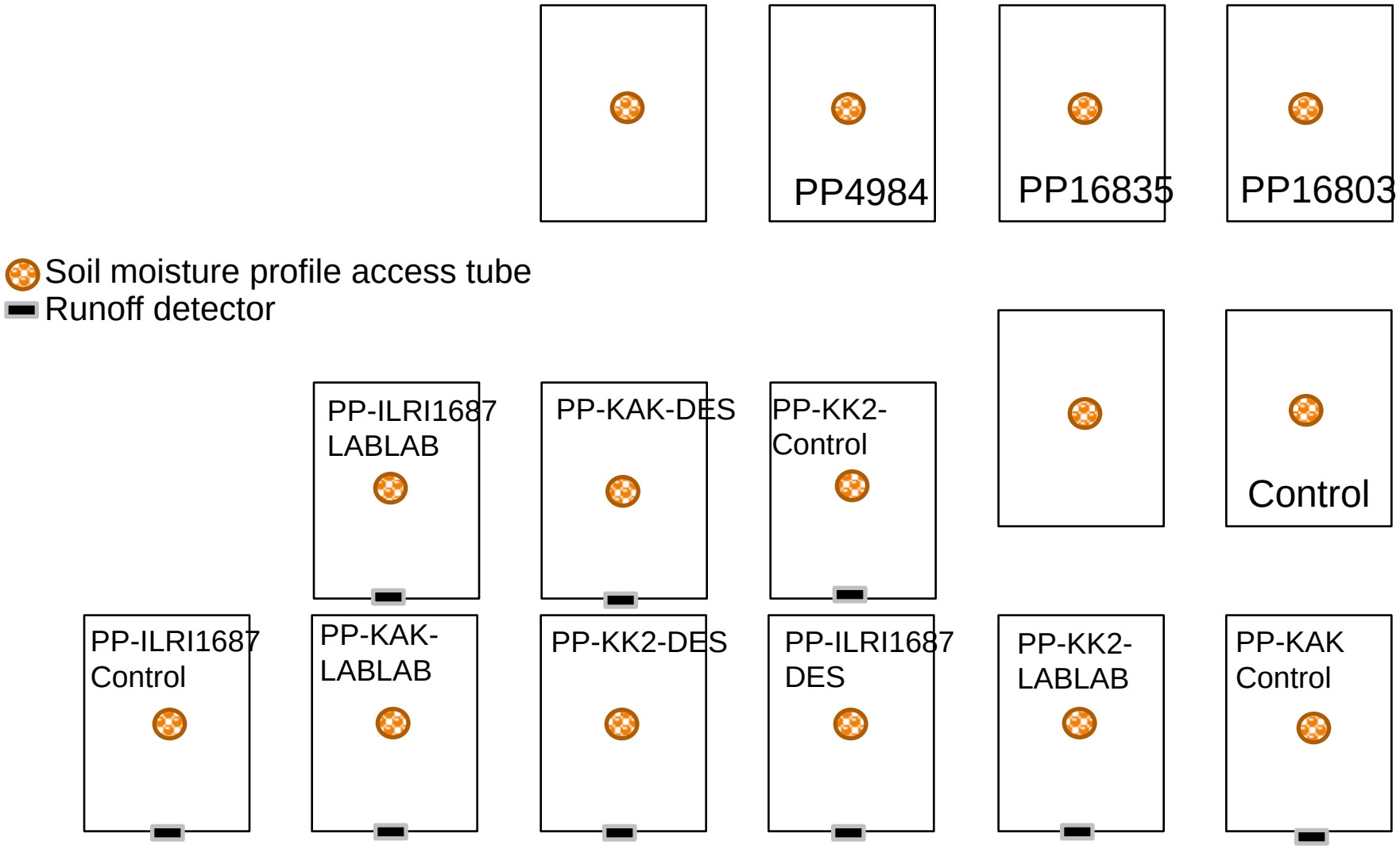
Objective: Demonstrate the impact of forage grasses and forage legumes on overall soil health, soil moisture capture and erosion control

Types of measurements: Rainfall amount (farmer managed), soil moisture content, infiltration trends, runoff detection and soil loss.
Actual runoff amounts are modeled, water balances estimated from nearby automated station, landscape sediment modeled with SWAT

Frequency of measurements: Soil moisture: Start, mid and end of the month.
Runoff detection and soil loss estimated periodically by accumulated volume of soil in soil traps.

Depth to the profile for soil moisture readings: 1 meter; Measurements taken at 10 cm intervals
Instruments being used
Rainfall: Rain gauge (automated and manual)
Soil moisture: Diviner 2000; Diviner 2000 consists of a probe and hand-held data logging display unit allowing the user to make onsite management decisions
Runoff detection: Infiltration tests with mini-disk infiltrometer
Soil loss: Calibrated soil traps
Other observations: Dates of planting, dates of harvesting, crop yields along different slope positions, water quality measures above and below the slope positions

Role of forage grasses on soil moisture and erosion mediation



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Mali Africa RISING Program

Birhanu Zemadim

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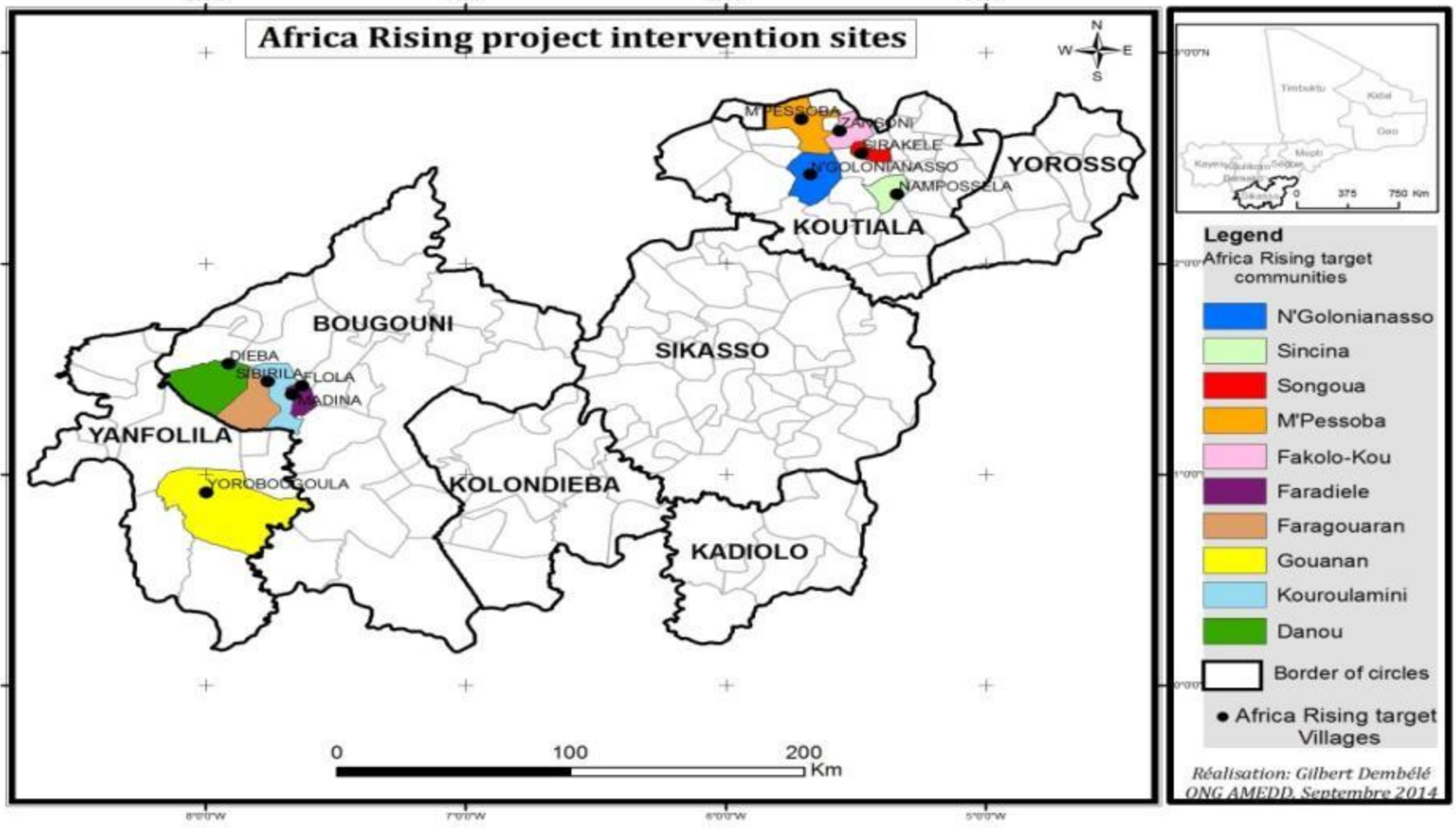
Study sites


Africa Rising project intervention sites
N
W
E
S
M'PESSOBA
ZANGUNI
SIRAKELE
N'GOLONIANASSO
NAMPOSSELA
YOROSSO
KOUTIALA
BOUGOUNI
SIKASSO
DIEBA
SIBIRILA
FLOLA
YANFOLILA
YOROBOUGOULA
KOLONDIEBA
KADIOLO
0
100
200
Km
Timbuktu
Kidal
Gao
Mopti
0
375
750 Km
Legend
Africa Rising target communities
N'Golonianasso
Sincina
Songoua
M'Pessoba
Fakolo-Kou
Faradiele
Faragouaran
Gouanan
Kouroulamini
Danou
Border of circles
Africa Rising target Villages
Réalisation: Gilbert Dembélé
ONG AMEDD, Septembre 2014

Managing Natural Resources to Increase Watershed Productivity

Crop trial establishment

Natural resources management

Biophysical characterization

Local conventions and conflicts management

Empowering local institutions to sustainably manage natural resources

Better management of natural resources

- Natural resources degradation

Reduction of food, feed & ecosystem imbalance

- Low crop & livestock productivity, increased frequency of natural hazards, i.e erosion, loss of habitat etc...

- Food insecurity
- Loss of resilience

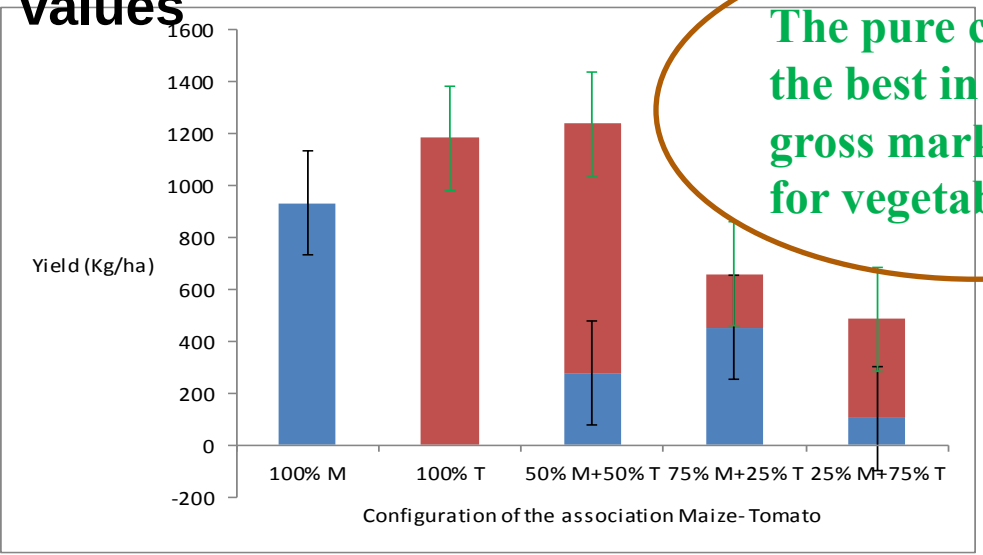
INTERCROPPING TRIALS

Groudnut + Roselle: Fleur 11 + Samandah & L28
Maize + tomato: Sotubaka + IXCRIXINA & AVTO1122
Maize + pepper: Sotubaka + Nisondia & Bafirama
Maize + Okra: Sotubaka + Batoumabè & Konni

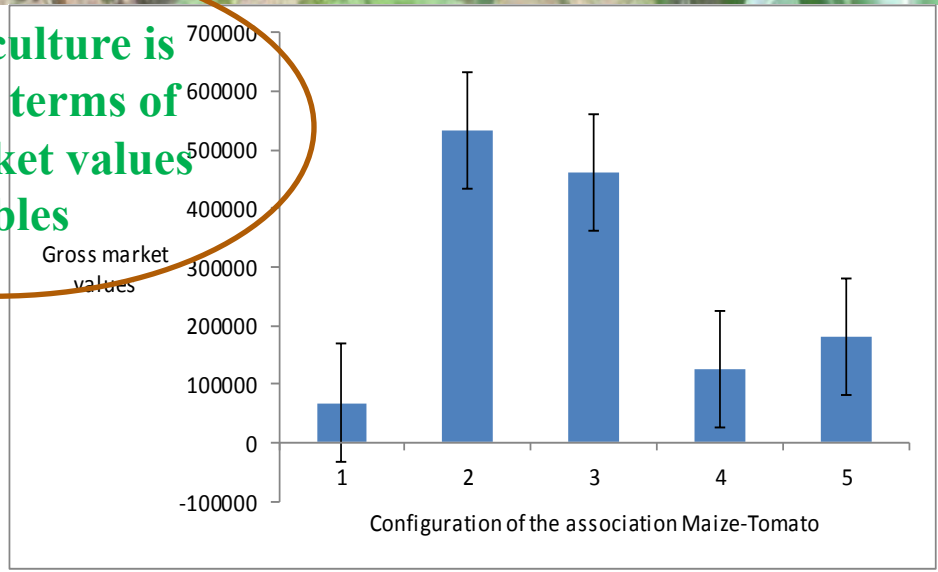
MONOCROPPING TRIALS

Tomato: ICRIXINA + AVTO1122 + local
Pepper: Nisomdia + Bafarima + local
Okra: Batoumbè + Konni + local
Roselle: Samandah + L28 + Local

Yield per plot & Gross market values



The pure culture is the best in terms of gross market values for vegetables



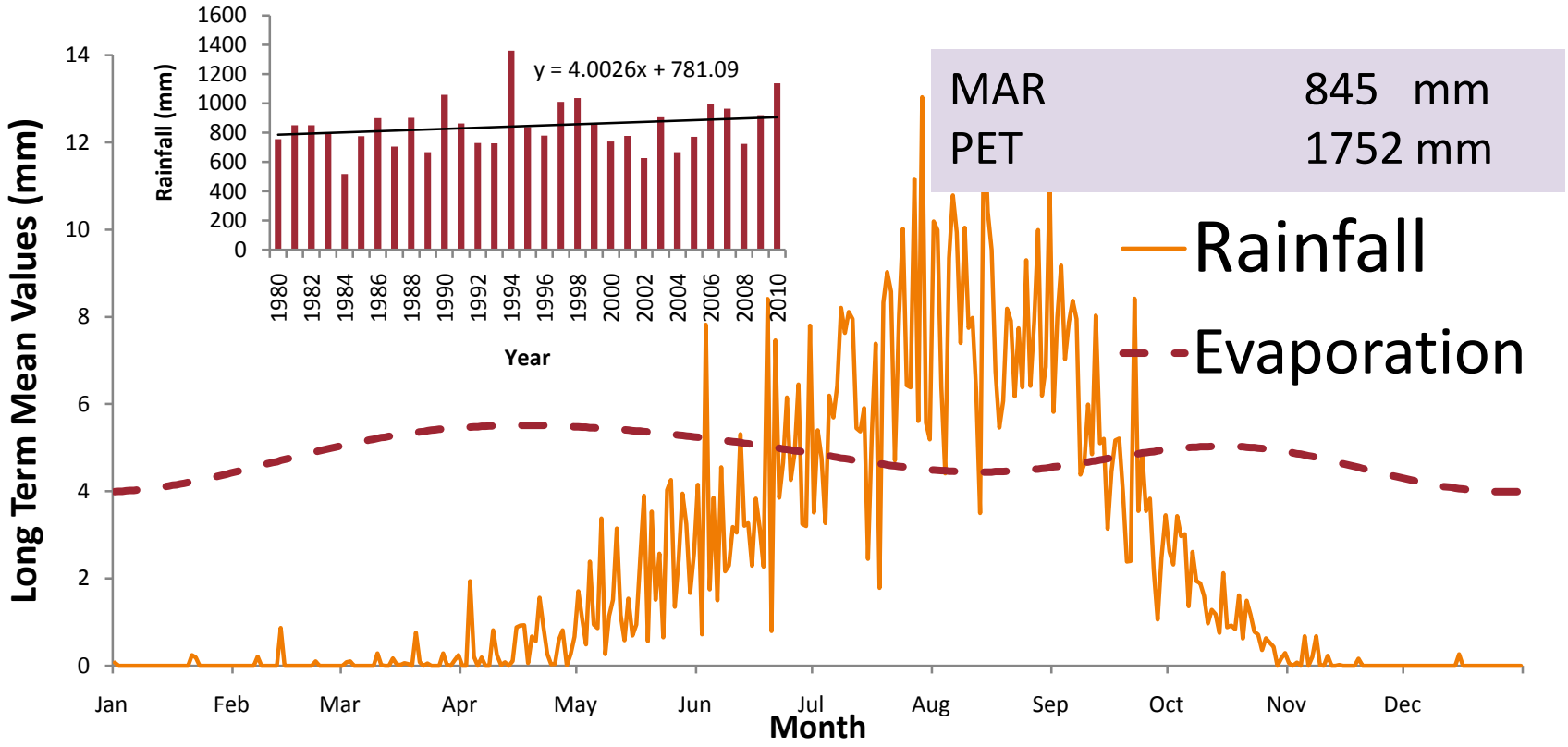
Agroforestry options

For intensive fruit, vegetable and fodder production

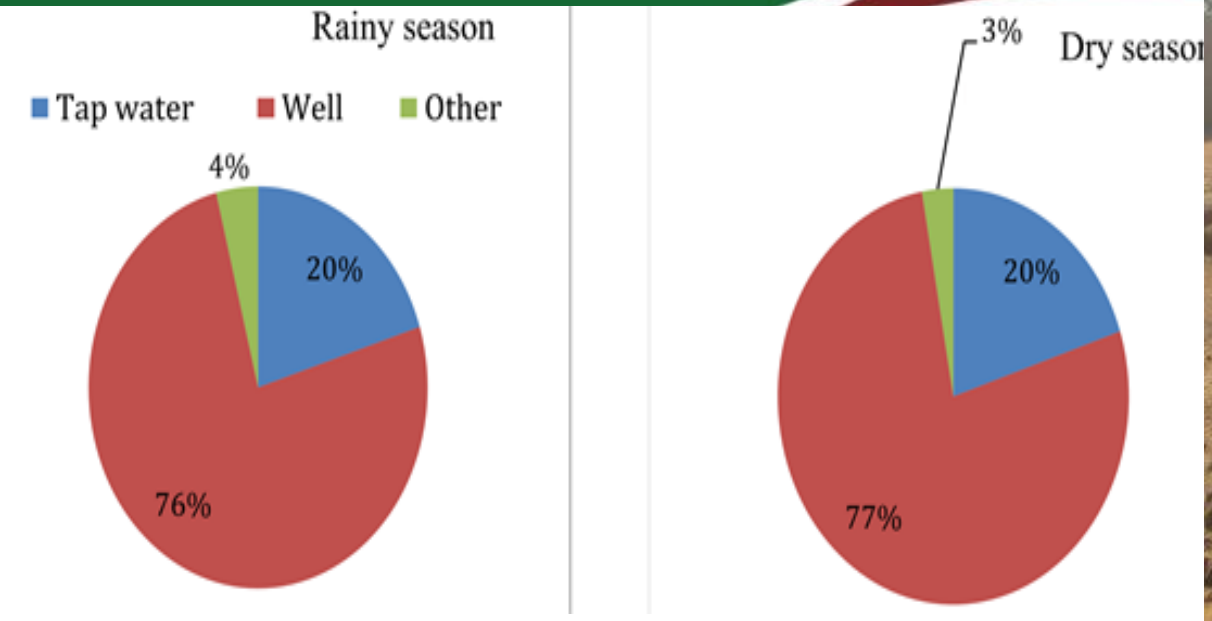
- On enclosed demonstration plots
  - Intensive fruit production
  - Intensive leafy vegetable production
- On-farm
  - Contour line management
  - Fertilizer and fodder tree species

	Height (cm)		Diameter (mm)		Canop	
Accessions	Mean	SE	Mean	SE	Mean	SE
Baobab Nonkene	66.6	8.4b	26.4	4.4a	42.1	8.7bc
Jujub 3A	97.7	13.2ab	13.4	1.9ab c	72.3	10.1a

Biophysical data characterization



Commonly used water sources



Well Inventory, geo-referencing and analysis

Bougouni: 150 Wells
All wells in Dieba, Floala, Madina and Sibirila
30% of wells in Yorobougoula

Koutiala: 335 Wells
All wells in Nampossela and Sirakele , Zanzoni (50%), Ngolonianasso (70%), M'Pessoba (30%)

Thank You

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IMPROVING WATER PRODUCTIVITY IN CROP-LIVESTOCK FARMING SYSTEMS IN NORTHERN GHANA

Davie Kadyampakeni

International Water Management Institute

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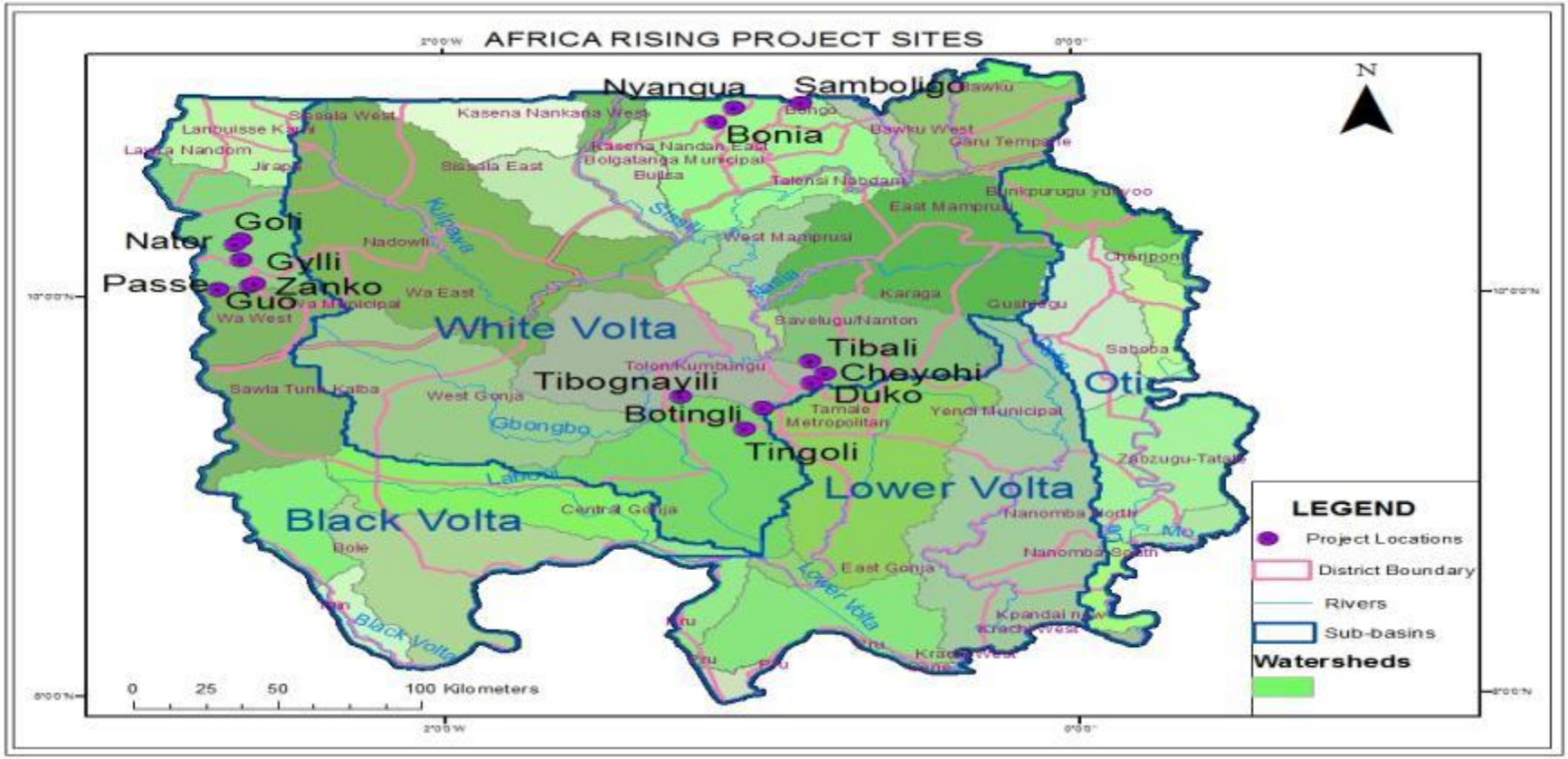
AFRICA RISING STUDY SITES GHANA



LAST YEAR'S ACHIEVEMENTS

Type of training	Number of people	Category of people
Rain gauge construction	40	24 farmers, 1 IWMI intern, 1 field assistant, 10 scientists, 1 NGO leader and 5 disabled NGO recipients, 3 steel fabricators (1 in Wa, 2 in Tamale)
Recording daily rainfall	7	1 field assistant, IWMI intern, 5 farmers
Runoff pit construction	12	1 field assistant, 1 IWMI intern, 10 farmers
New implement designs	6	1 Chairman of board [Tamale Implement Factory (TIF)], 2 General Managers (TIF and Goodman), 1 factory foreman (TIF), 2 steel fabricators (TIF and Goodman)
Introduction to earthmoving technology with draft animals	10	1 NGO (2 persons), 6 communities (about 12 to 15 people contacted), 1 scientist, 1 community worker

CURRENT ACTIVITIES

TESTING SMALL-SCALE IRRIGATION OPTIONS FOR DRY SEASON VEGETABLE PRODUCTION

- Site/Watershed characterization
- Participatory evaluation of water lifting and water delivery methods for vegetable production
- Assessment of irrigation frequency and amount using different irrigation scheduling methods
- Socio-economic analysis of water management interventions for dry season vegetable production

IMPROVING WATER PRODUCTIVITY IN RAINFED CROP-LIVESTOCK PRODUCTION SYSTEM

- **Exploring the potential for forage irrigation in Northern Ghana**

- **Piloting supplementary irrigation for forage**

Acknowledgement of project partners

Local partners Ghana

- **Academic institutions:**
  - Kwame Nkrumah University of Science and Technology
- **NGO:**
  - BADECC

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Africa RISING-ESA Project

APPLICATION OF PHYSICAL AND BIOLOGICAL BARRIERS FOR EROSION CONTROL IN AGRO-PASTORAL COMMUNITIES OF KITETO AND KONGWA, TANZANIA

Introduction

Low crop productivity in semi-arid of Kiteto and Kongwa District is caused by severe soil water erosion among others mainly characterized by interill, rill and gully.

Main causes of soil erosion in Kiteto and Kongwa Districts:

- Overgrazing.
- Poor farming practices.
- Lack of knowledge on control of soil erosion.

CONTROL OF SOIL EROSION IN KITETO AND KONGWA DISTRICT

From 2012/2013 cropping season to date an attempt has been made under "***Africa RISING Project***" to fast track the integration of soil erosion control measure in cropping and land management systems.

For effective control measures efforts have been geared towards the use of ***"landscape approach***" through fully engagement of farming communities in the entire process of implementing the followings strategies:

- **Application of physical and biological barriers on control of soil erosion**
- **Assessment of the efficacy of physical barriers for erosion control.**
- **Testing of in situ water harvesting technologies.**

Application of Physical and Biological barriers on Control of Soil Erosion in KK:

Run-off plots

Participatory run-off measurement at Mlali village, Kongwa

Maize field with Fanya juu terrace at Njoro village, Kiteto

Pearl millet field with Fanya juu terrace at Laikala village, Kongwa

Insitu rainwater harvesting technique at Chitego, Kongwa

Assessment of the efficacy of physical barriers for erosion control

- Participatory assessment of runoff loss begun in 2013/2014 cropping season in soil erosion prone areas of Kongwa District using standard runoff plots.

- **The experiment consist of four treatments, namely**:
  - ❖Bare plot (BP)
  - ❖Flat cultivation (FC)
  - ❖Ripping tillage (RT).
  - ❖Tie Ridging (TR)

- Runoff measurements from runoff collection system are being recorded and calibrated as follows:

RO = Q/CA; Where RO = Runoff, in mm; Q = Runoff volume, in l and CA = catchment in m^2

Landscape level adoption of In-situ Rainwater harvesting technologies

- In Kiteto/Kongwa semi-arid zones of Tanzania crop production is threatened by unpredictable soil water supply and limited growing season length (3-4 months).
- Climate Change prediction models estimate that areas with uni-modal rainfall patterns in Tanzania will experience decreased rainfall of 5% to 15%.
- In view of the above, at the inception of 2012/2013 cropping season, Participatory on-farm testing of the effect of in-situ rainwater harvesting techniques (IRWH) on crop performance was initiated in Kiteto and Kongwa District.
- Three treatments under investigation include ox- plough (i.e. farmer practice); Ripping (using ox-ripper) and Tie ridging (using ox-ridger).

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Sustainable Intensification of Maize-Legume Systems for the Eastern Province of Zambia – Africa RISING (SIMLEZA-AR)

Implementing Partners:

- CIMMYT/IITA (lead institutions)
- ZARI, TLC, UNZA, MAL, MoH
- **Key Stakeholders:** IP-members (governmental, private sector, research, NGOs)
- Coverage: Eastern Province
- Start date: September, 2011
- Completion date: September 30, 2015




SIMLEZA Project Sites

On-farm activities

- **Chipata District:** Chanje, Kapara and Mtaya camps
- **Katete District:** Kafumbwe and Kawalala camps
- **Lundazi District:** Hoya and Vuu camps

On-station activities

- Msekera, GART, Kabwe, Misamfu
- Harare

Purpose / Goals

- **Productivity focus:** Sustainable maize-legume and seed systems
- **Nutrition focus:** Soybean processing and utilization
- **Capacity building:** NARS, NGOs seed companies and farmers

SIMLEZA Objectives

- **To enhance technology targeting and delivery of input and output markets through value chains**
- **To facilitate adoption and adaptation of productive, resilient and sustainable agronomic practices for maize-legume cropping systems.**
- **To improve diet diversification through soybean use at the household**
- **To increase the number of maize and legume varieties adapted to small scale farm conditions**
- **To enhance the capacity of national partners.**

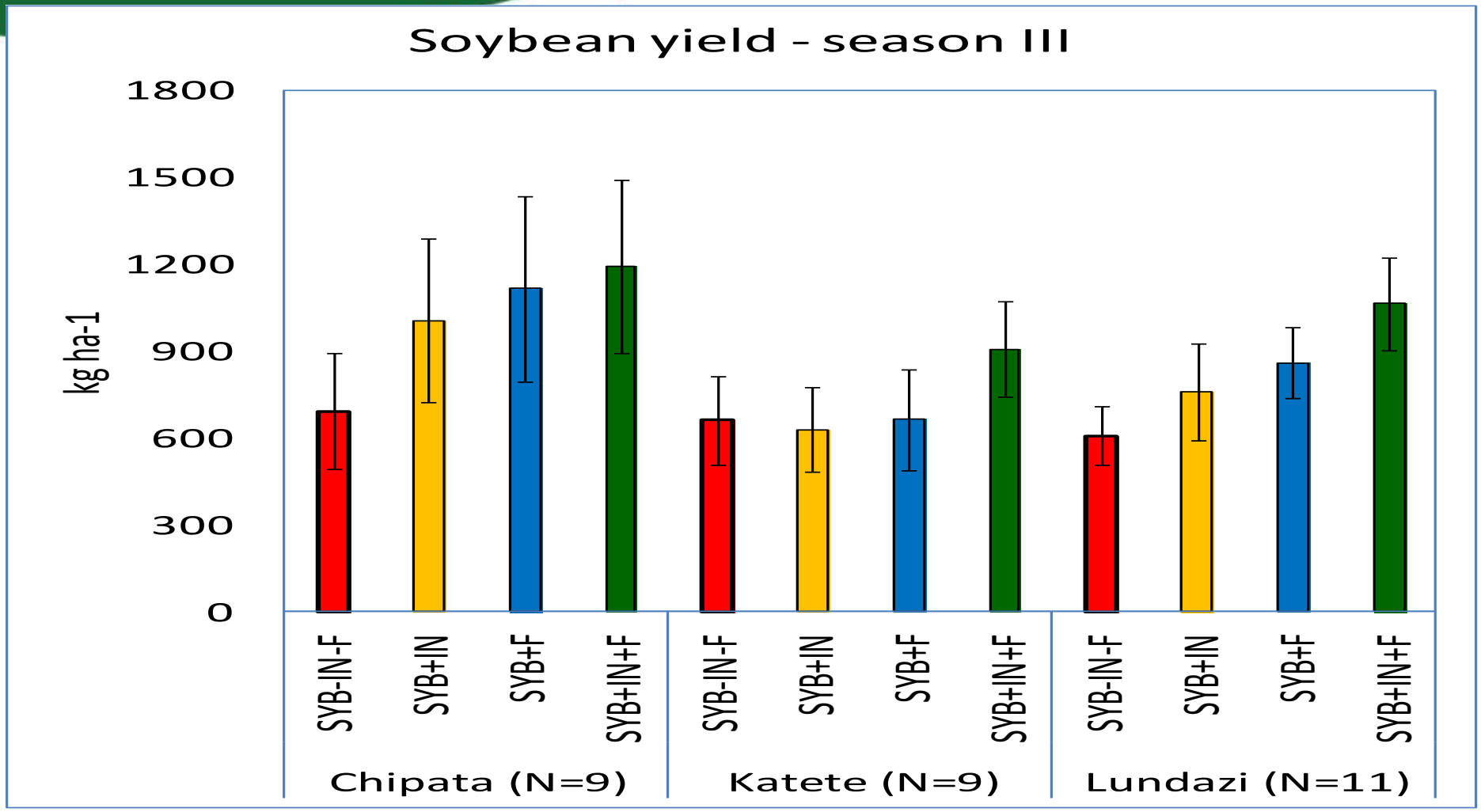
Improve smallholder farmers access and use of maize-legume based agronomic management practices

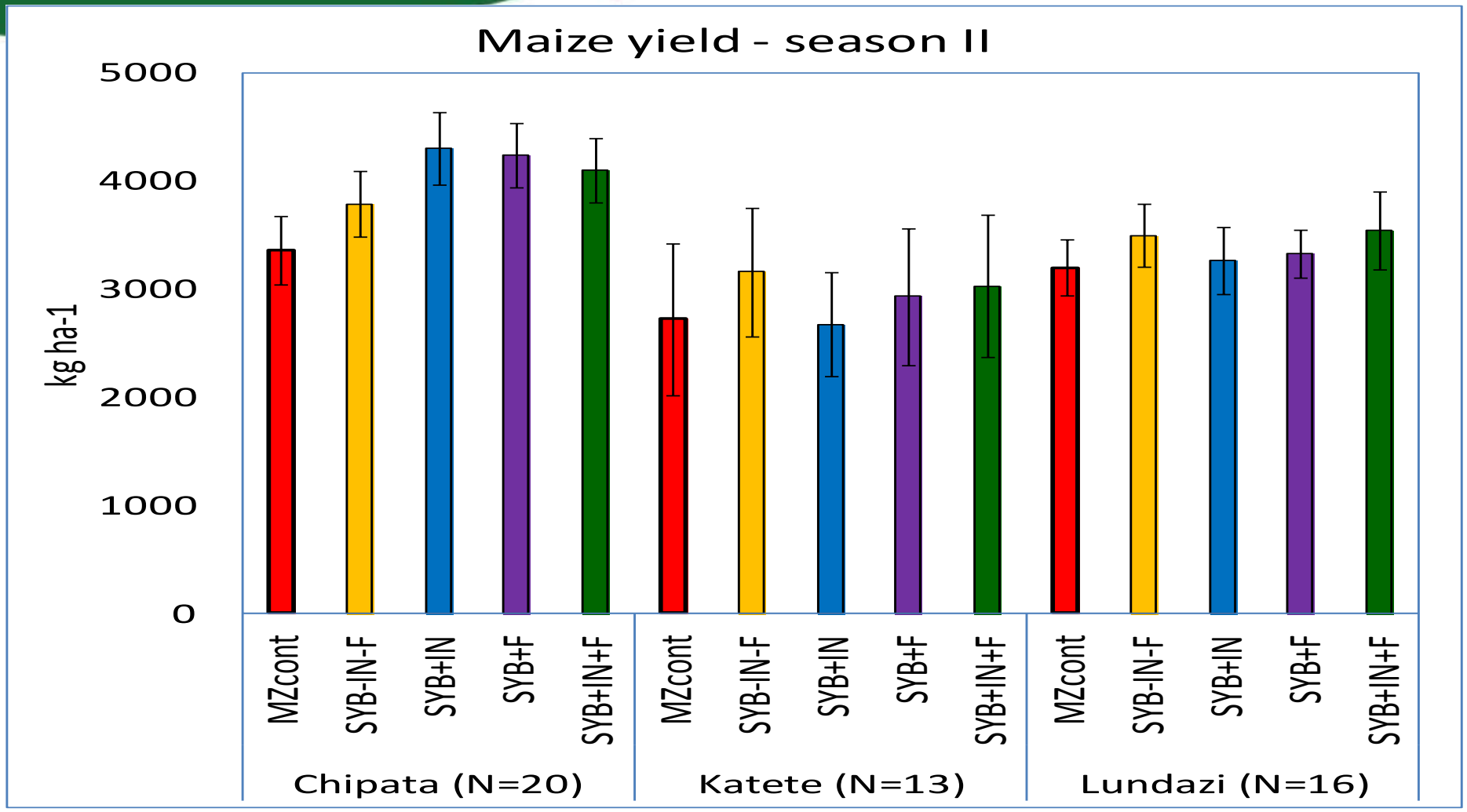
Objective: to demonstrate the effects of inorganic fertilizer application with or without the use of inoculant on productivity of soybean (as a precursor crop) and the maize crop that follows the legume in a rotation system.

Number of farmers hosting trial (2014/15): 31

- 21 in fourth season (SYB – MZ – SYB)
- 10 in third season (SYB – MZ)

Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Maize (continuous maize)	Soybean - IN - F (rotated with maize)	Soybean +IN (rotated with maize)	Soybean +F (rotated with maize)	Soybean + IN +F (rotated with maize)


Soybean yield - season III
kg ha-1
1800
1500
1200
900
600
300
0
SYB-IN-F
SYB+IN
SYB+F
SYB+IN+F
SYB-IN-F
SYB+IN
SYB+F
SYB+IN+F
SYB-IN-F
SYB+IN
SYB+F
SYB+IN+F
Chipata (N=9)
Katete (N=9)
Lundazi (N=11)


Maize yield - season II
5000
4000
3000
2000
1000
0
kg ha-1
MZcont
SYB-IN-F
SYB+IN
SYB+F
SYB+IN+F
MZcont
SYB-IN-F
SYB+IN
SYB+F
SYB+IN+F
MZcont
SYB-IN-F
SYB+IN
SYB+F
SYB+IN+F
Chipata (N=20)
Katete (N=13)
Lundazi (N=16)

Conservation Agriculture

Manual CA System

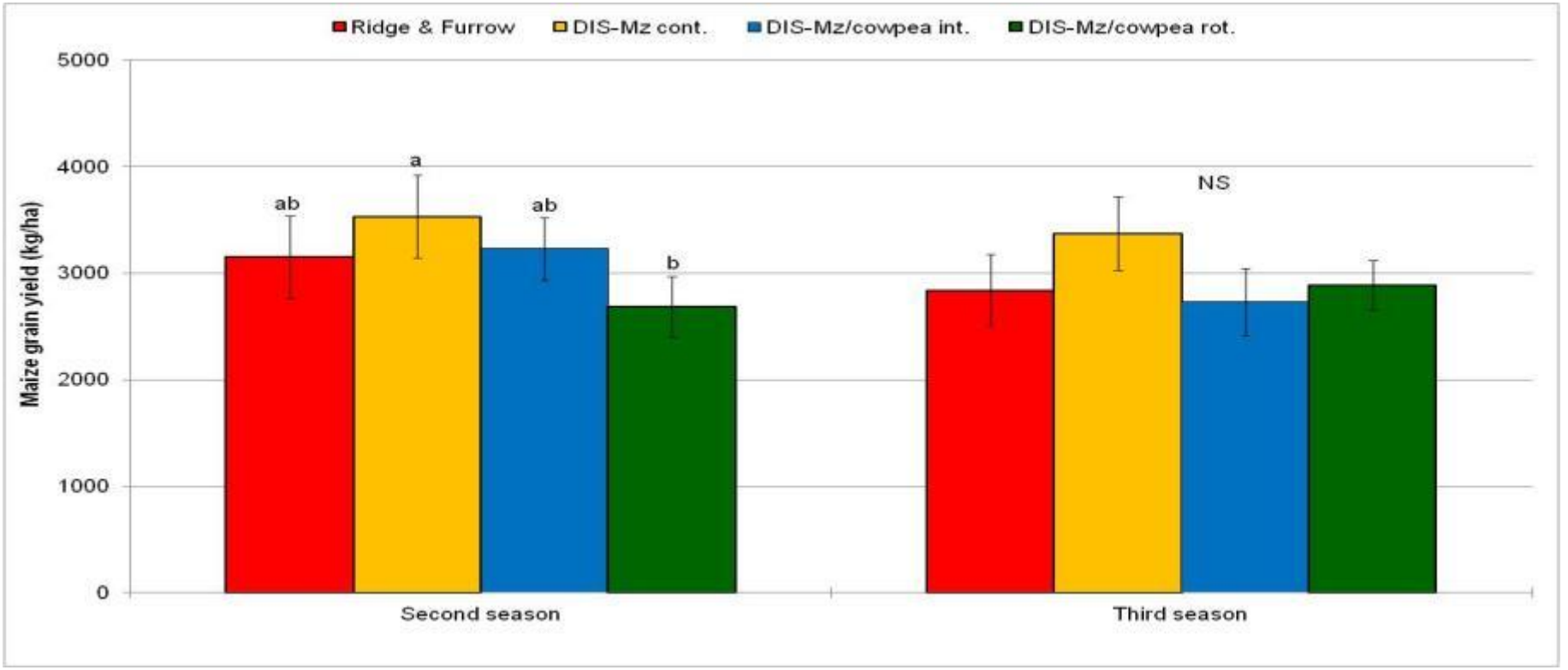
Treatment 1	Treatment 2 (CA)	Treatment 3 (CA)	Treatment 4 (CA)	Treatment 5 (CA)
(Plot 1) Conventional practice (mouldboard plowing) Maize (continuous)	(Plot 2) Dibble stick Maize (continuous)	(Plot 3) Dibble stick Maize/Cowpea Intercrop	(Plot 4) Dibble stick Cowpea (rotated with Maize)	(Plot 5) Dibble stick Maize (rotated with cowpea)

Animal Traction CA System

Treatment 1	Treatment 2	Treatment 3	Treatment 4
Conventional practice (mouldboard plowing) Maize (continuous)	(CA) Ripping Maize (continuous)	(CA) Ripping Maize (rotated with soybean/cowpea)	(CA) Ripping Soya/cowpea (rotated with maize)

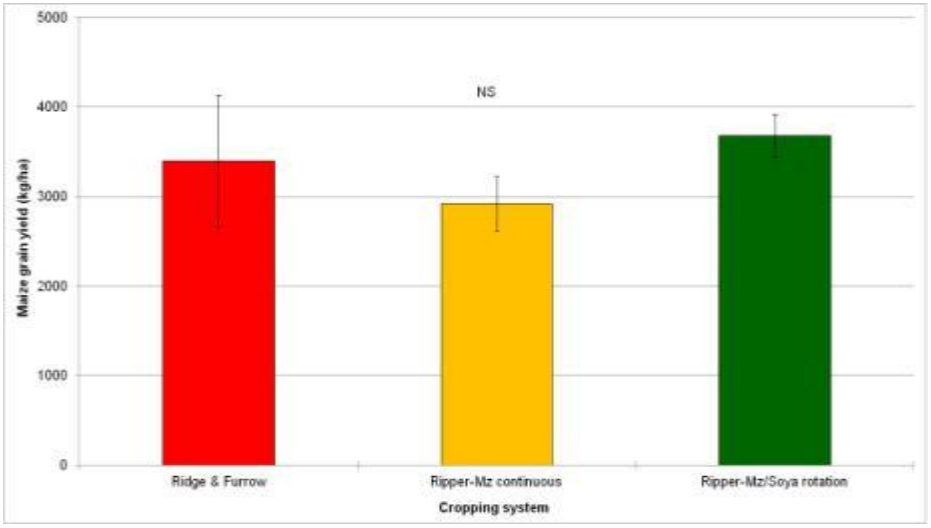
Manual CA Systems

- Ridge & furrow system vs. direct seeded system (Dibble stick)

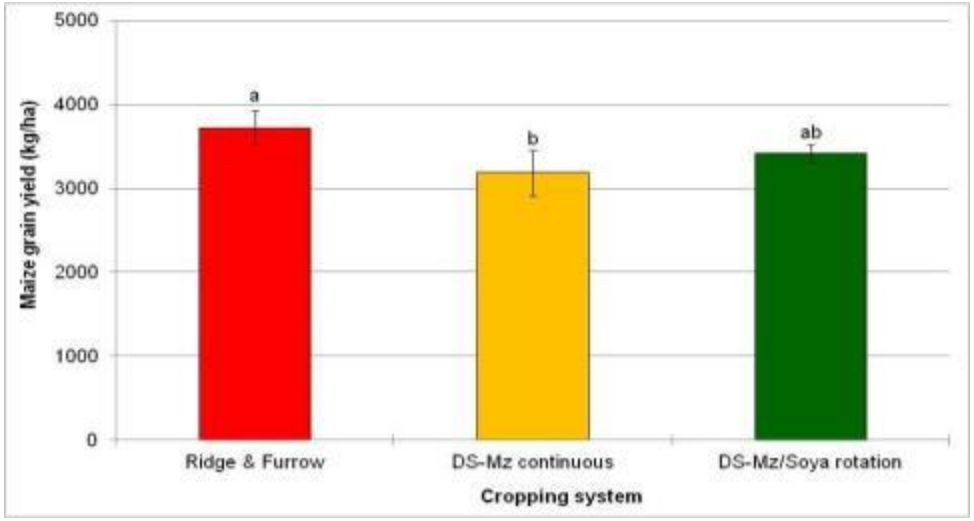


Animal Traction CA Systems

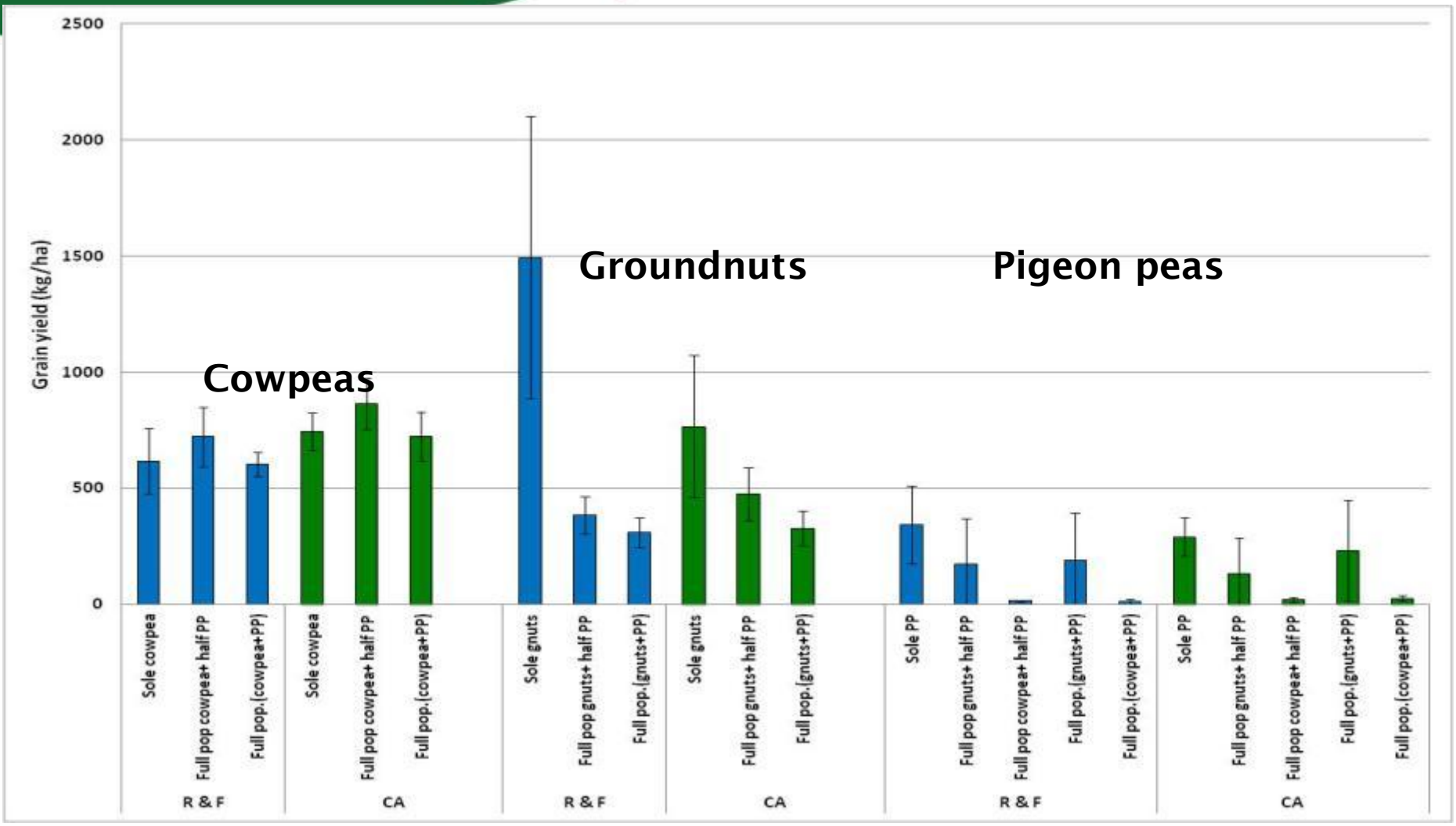
Ridge & furrow system vs. Ripline seeding system



Ridge & furrow system vs. Direct seeding system



DOUBLED UP LEGUMES


Grain yield (kg/ha)
2500
2000
1500
1000
500
0
Cowpeas
Groundnuts
Pigeon peas
Sole cowpea
Full pop cowpea+ half PP
Full pop.(cowpea+PP)
Sole cowpea
Full pop cowpea+ half PP
Full pop.(cowpea+PP)
Sole gnuts
Full pop gnuts+ half PP
Full pop.(gnuts+PP)
Sole gnuts
Full pop gnuts+ half PP
Full pop.(gnuts+PP)
Sole PP
Full pop gnuts+ half PP
Full pop cowpea+ half PP
Full pop.(gnuts+PP)
Full pop.(cowpea+PP)
Sole PP
Full pop gnuts+ half PP
Full pop cowpea+ half PP
Full pop.(gnuts+PP)
Full pop.(cowpea+PP)
R & F
CA
R & F
CA
R & F
CA

Awareness and demand creation for

Through

- On-farmer trial/demonstration evaluations
- Field days
- Engagement of media
- Innovation platform fora

SUCCESSES

- **Farmers overwhelmingly participates field days.**
- **Early, mid, late & end of season meetings**
- **More farmers are participating in conservation agriculture**
- **Farmers have started using inoculum**

Thank you very much!

THE END